Does Capitation Matter?

Impacts on Use, Prevention, Access, and Patient Satisfaction

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Abstract: Physician capitation creates incentives for more efficient delivery of care, but it also creates incentives to underprovide care, especially where providers are imperfect agents for patients and informational asymmetries abound. Studies have found capitated physicians provide fewer visits, and their patients have fewer specialist visits and fewer hospital admissions, but less is known about the impacts of capitation on access, satisfaction, and receipt of preventive care. We examined the impacts of capitating consumers' usual source of care on consumers' access to their usual source of care, receipt of preventive services, service use, and satisfaction. Our study, unlike previous studies, controls for other plan and provider characteristics and attempts to account for the endogeneity of capitation and these charactertistics using instrumental variable methods. The data are a nationally representative sample of privately insured persons from Household and Medical Provider Components (MPC) of the Medical Expenditure Panel Survey (MEPS) for 1996 and 1997. Preliminary results indicate estimates of the effects of capitation are sensitive to estimation techniques, and further research will attempt other instrumental variables techniques.

1.   Introduction

Capitation is widely used, and although capitation is often thought to reduce access and quality, little is known empirically. In 1999, over half of primary care providers and a third of specialists had at least one capitated contract with a plan, but these contracts tend to account for a small proportion of revenue (American Medical Association 2000). Capitation is more prevalent for physician-owners of larger practices and employee physicians. In the large urban areas, three-quarters of HMOs predominantly capitate intermediate entities that contract with primary care providers (Gold et al. 2002).

Capitation creates incentives for more efficient delivery of care, but it also creates incentives to provide less care than consumers desire, especially where providers are imperfect agents for patients and informational asymmetries abound. The likely effects of capitation depend on which services are paid for out of the capitation payment. For example, if capitated providers are responsible for payments to specialists, they may provide more services themselves and reduce referrals (Iversen and Luras 2000). Because capitated providers are not paid for each service used, they may have less incentive to promote access. On the other hand, if capitated providers are responsible for payments for emergency care, they may have an incentive to increase access to care to avoid emergency room use for services that are not emergencies. Although capitated providers may provide more preventive care to avoid higher future use and referrals, fee-for-service providers are paid directly for preventive care services, and hence may have a greater incentive to provide them.

Studies have found capitated physicians provide fewer visits, and their patients have fewer specialist visits, and fewer hospital admissions (Gosden et al. 2001; Hellinger 1996). Less

is known, however, about the impacts of capitation on access, satisfaction, and receipt of preventive care.

Previous studies of capitation face several potential sources of bias. First, other plan and provider characteristics may be related to consumer outcomes, and failing to include these characteristics in the analysis may cause omitted variable bias. Second, consumers choose plans and providers, and providers and plans choose payment arrangements, so plan and provider characteristics are likely endogenous. For example, consumers are likely to be satisfied with their providers whether or not payments are capitated, because otherwise they would switch providers or plans. Finally, many capitation studies use selected populations or small numbers of plans.

We examined the impacts of capitating privately-insured consumers' usual source of care on consumers' access to their usual source of care, receipt of preventive services, health care use, and satisfaction. HMOs are more likely to capitate primary care physicians (Gold et al. 2002), and, as consumers' primary link to the health care system, they likely have the greatest impact on most consumers. The data are from Household Component (HC) and Medical Provider Component (MPC) of the nationally representative Medical Expenditure Panel Survey (MEPS) for 1996 and 1997. To reduce omitted variable bias, we use a few HMO characteristics merged onto our file from InterStudy, an industry source, along with a household-reported provider characteristic. To reduce endogeneity bias, we attempt instrumental variable estimation techniques, where county-level HMO enrollment and other factors are instrumental variables. The results are preliminary.

2.   Literature

A small number of rigorous studies have found capitation reduces service use relative to fee-for-service reimbursement (Gosden et al. 2001). Specifically, capitated physicians provide fewer visits, and their patients have fewer specialist visits and fewer hospital admissions.

Studies have found capitating providers, relative to fee-for-service payment, is associated with less satisfaction, with mixed results for access and preventive services. Among enrollees in eight IPA model HMOs, consumers with capitated providers had less access to their providers, reported poorer provider communications, and reported the provider had less provider knowledge of the consumer (Safran et al. 2000). In a study of 25 Medicaid HMOs in four states, enrollees in HMOs that capitate physicians had somewhat better access to care, but similar levels of preventive care and satisfaction (Moreno et al. 2001). In a case study comparing four Medicaid managed care plans, enrollees with disabilities in three plans capitating physicians were less likely to receive preventive services than those in a plan paying fee-for-service, but access to the providers was similar (Hill and Wooldridge 2002). In a family health center, patients were less satisfied with technical quality and medical care if their care was paid by capitation rather than by fee-for-service (Murray 1988). In addition, in an analysis of enrollees in HMOs participating in the Consumer Assessment of Health Plans, consumers in HMOs that capitate providers gave lower ratings of their HMOs than did consumers in other HMOs (Scoggins 2002).

These studies of access, satisfaction, and preventive care did not account for potential sources of bias. All five are studies of selected populations or plans. No studies include provider characteristics, which likely have a direct effect on consumer outcomes. Hill and Wooldridge (2002), Moreno et al. (2001), Safran et al. (2000), and Scoggins (2002) controlled for consumer

characteristics, while Murray (1988) did not. Scoggins (2002) also controlled for three HMO characteristics: whether the plan had bonuses, whether the plan had withholds, and the percent of the plan's network that was board certified.[1] Other important but unmeasured characteristics may include, for example, the plan's network and utilization management, how much of the provider's practice is capitated, and whether the provider has stop loss for the capitation payments.[2] These effects of these plan and provider characteristics may be confounded with the effects of capitation, resulting in potential omitted variable bias, and proxy variables for plan characteristics may create measurement error.

Key variables are likely endogenous, which may also bias the estimates. First, providers negotiate payment arrangements based on their preferences and other characteristics. For example, providers who prefer to practice a conservative style of medicine are likely more willing to receive capitated payments, and these providers reduce service use, but this characteristic is not taken into account in analyses of consumer outcomes. Ignoring this endogeneity leads to overestimates of the reduction in access and service use due to capitation. Second, consumers choose their physicians based on provider characteristics. For example, consumers who prefer less medical care may choose physicians with a conservative practice style, and they will be satisfied with their lower level care, whereas consumers with different preferences would not be satisfied. This type of consumer characteristic is unmeasured in the analysis of consumer outcomes, and this omission leads to underestimates of the effects of capitation on satisfaction with provider. Third, consumers choose their plans based on plan

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[1] Hill and Wooldridge (2002), Moreno et al. (2001), and Safran et al. (2000) also study other HMO characteristics, but they do not control for these characteristics in analyzing capitation.

[2] Almost all plans that capitate use stop loss, use provider reinsurance, risk adjust, or exclude high-cost cases from the capitation (Gold et al. 2002). Plans may also have withholds and performance bonuses, which may work with or against the incentives of fee-for-service or capitation. Withholds and bonuses, including those sharing risk for utilization or expenditures, tend to account for under 5 percent of compensation to primary care providers.

characteristics or factors correlated with plan characteristics. For example, consumers who do not expect to need many services may select HMOs that capitate their physicians, perhaps because those plans may be less expensive. Estimates are biased due to unmeasured consumer characteristics that affect both outcomes and enrollment in HMOs that capitate their physicians.

Another issue is whether the effects of capitation are attenuated by the methods used by provider groups to pay their members. Sixty-seven percent of physicians in groups that receive more than half their revenue from capitation are paid based on individual productivity (Stoddard et al. 2002). However, groups with less revenue from capitation are more likely to pay their members based on productivity, which suggests that groups may change their internal incentives in response to payment from plans. Due to data limitations, most studies are not clear about who is capitated, the particular physician or a group or other intermediate entity, and our study has the same limitation.

3.   Estimation Methods

We estimate the model:

$$Y = f(\beta_0 + \beta_c C + \beta_h'H + \beta_m'M + \beta_x'X) + \epsilon \tag{1}$$

where Y is the consumer outcome (access, service use, etc.), C is an indicator for whether the provider is capitated, H is a vector of observed health plan characteristics, M is a vector of observed provider characteristics, X is a vector of observed consumer characteristics, and ϵ is unobserved factors. The functional form depends on the outcome measure: linear, binary (probit), and (in future work) ordered probits and count data models. As previously emphasized C, H, and M are endogenous.[3]

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[3] We conducted heuristic tests for the exogeneity of the capitation and HMO variables using a method proposed by Reschovsky (1999/2000). He hypothesized that if the association between HMO enrollment and consumer outcomes is due in part to endogeneity, then persons with a choice of plan would likely have a stronger association.

For comparative purposes, we estimated equation (1) using ordinary least squares and (2) using maximum likelihood probit methods, assuming C, H, and M were exogenous. All the standard errors and significance tests are based on robust standard errors to account for survey design. In the future, we will calculate standard errors of the marginal effects.

We used two instrumental variables estimators, and in the future we will use a third technique that is more computationally intensive. We first estimated the linear models using weighted two-stage least squares (2SLS) regressions. In the first stage, we regressed the endogenous variables C, H and M, on the exogenous variables and instruments, W, that were predictive of C, H and M but uncorrelated with ϵ. For example,

$$C = \pi_x'X + \pi_w'W + \eta$$

Our instruments, described in the data section, are county-level variables, primarily county-level measures of HMO enrollment, physicians per capita, and hospitals. The endogenous variables are all binary, so we estimated these as linear probability models. In the second stage, the predicted values from these regressions were substituted for the endogenous variables. We conducted overidentification tests of the hypothesis that the instruments were orthogonal to the errors of the second stage by regressing the residuals from the second stage on the exogenous variables and the instruments.

For the binary outcomes, we estimated Amemiya's generalized least squares (AGLS) probit regressions, which are more efficient than two-stage methods and as efficient as estimating a fully parameterized multiple equation model (Newey 1987). AGLS recovers the

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Reschovsky tested this hypothesis by interacting HMO enrollment with whether the family had a choice of plans and found no additional effect. We adapted this test by interacting capitation and whether the family had a choice of plans. In the regressions where capitation was associated with consumer outcomes, we found the association was greater for those who had a choice of plans, confirming the need to account for endogeneity. Note that this interaction does not test the hypothesis of endogeneity due to plan and provider matching or consumer choice of providers.

structural parameters from a reduced form regression through minimum chi-squared regression of the parameters. As with the 2SLS methods, we assume that the endogenous variables are linear functions of the exogenous variables and instruments. AGLS has several steps. Using ordinary least squares, we first regressed the endogenous variables on the exogenous variables and the instrumental variables, to yield coefficients π, predicted residuals $\hat{\eta}$, and fitted values of the endogenous variables. Then we estimated a maximum likelihood probit regression of the outcome variable on the exogenous and fitted values of the endogenous variables to yield two-stage instrumental variable estimates of the coefficients, $\tilde{\beta}$. Then we estimated a reduced form maximum likelihood probit regression of the outcome variable on the exogenous variables, the instruments, and the vector of residuals $\hat{\eta}$, to yield coefficients, α. The structural parameters β are estimated by regressing α on π, weighted by $\alpha-\pi\tilde{\beta}$. For the preliminary results in this paper, we tested the orthogonality of the instruments to the errors using 2SLS regressions, where the binary outcomes were estimated as linear probability models.

In the future, we will use a Generalized Method of Moments (GMM) estimator (Hansen, 1982), which generalizes Amemiya's (1985) non-linear two-stage least squares (NL2S) procedure to account for heteroskedasticity, in order to estimate consistent coefficients for the outcome variables. In this approach, rather than minimizing the likelihood function or the mean squared error, we instead minimize a linear combination of the instruments and ϵ^2. An advantage of this approach is there are no parametric assumptions about plan-provider contracting, consumer selection of providers, and consumer selection of plans. In particular, the method does not assume the endogenous variables are linear functions of the exogenous variables and the instruments. A second advantage is that we will be able to use more information about the outcome variables: we will be able to estimate the satisfaction variable

using an ordinal model and the visits using exponential models. A disadvantage of the GMM approach is that it is computationally intensive, which prohibited our using this method for this draft of the paper. The steps in the estimation procedure follow. First, we will estimate the vector of coefficients by minimizing

$$(Y-f)'W(W'W)^{-1}W'(Y-f),$$

where W is the matrix of instruments, with respect to the coefficients. Then, we used the residuals to calculate an optimal weighting matrix to account for heteroscedasticity, $\Omega = (Y-f)(Y-f)'$, and minimize

$$(Y-f)'W(W'\Omega W)^{-1}W'(Y-f).$$

We will test the validity of the instruments using Hansen's generalized method of moments overidentification test for whether the instruments are jointly orthogonal to the error term of the outcome equation (Davidson and MacKinnon 1993).

4.   Data

We use three sources of data: the Medical Expenditure Panel Survey (MEPS), which has many consumer and some provider characteristics, augmented with HMO characteristics from Interstudy and market characteristics from the Area Resource File. Our sample is privately insured persons with a usual source of care visited by at least one family member during the calendar year. In this section, we first describe our sample from the MEPS, the capitation variable, other key variables by topic, and conclude by summarizing our analyses that suggest sample selection bias is small.

4.1   MEPS Sample

The MEPS data are from the Household Component (HC), a nationally representative household survey, and its Medical Provider Component (MPC). Beginning in 1996, each year a

new panel of households is sampled and interviewed five times over two and a half years. We include people from the first year of the first panel (1996) and the first year of the second panel (1997) who were present in households during the second interview where access and satisfaction questions were asked. We study privately insured, non-elderly persons to avoid confounding differences due to capitation with differences between private and public coverage. We further limit our sample to people with a usual source of care (other than an emergency room), because payment data are available for only those with providers.

The MPC collects data (including whether the service was capitated) on services used by a subsample of households in the HC. In 1996, all inpatient and outpatient hospitals visited by family members were sampled with certainty. For office-based visits, families were the sampling unit, and families were oversampled if they had at least one member in an HMO or in Medicaid (Machlin and Taylor 2000). In 1997, hospitals and office-based physicians were further subsampled. We reweighted the HC sample to reflect the MPC sample design in both 1996 and 1997.[4] Our final sample is 4,241 privately-insured, nonelderly individuals where we could determine from the MPC whether a usual source of care provider was capitated or not by a person's health care plan. Specifically, provider payment data are available only if at least one family member visited the usual source of care.

4.2   Capitation Variable

It is important to clearly define what we mean by capitation in the context of our analyses, because the term can have so many different meanings. The MPC collects payment data from billing offices for hospitals and physicians. For sole-practitioners, our capitation

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[4] Fifteen percent of sampled household members did not complete permission forms and about 12 percent of sampled providers did not provide payment information (Machlin and Taylor 2000). Our reweighting does not adjust for differential nonresponse, but we control for characteristics associated with nonresponse in the regression analysis.

variable then simply measures whether the usual source of care provider was reimbursed on fee-for-service basis by the health plan or whether the visits were covered by some capitated arrangement. For group practices, our capitation variable measures how the group was reimbursed by the health plan, but not how individual providers are paid within the group (for example, strictly fee for service, salary, revenue sharing, etc.). Obviously, how groups reimburse individual providers also create incentives, which may impact how care is provided to patients. However, we can only examine the effects of capitation at the group level. Finally, for staff/group model HMOs that own their own clinics and offices (and in rare instances, hospitals), the MPC generally obtains charge and payment information from the plan itself for office-based services. Visits to a usual source of care provider in this instance are considered capitated in the MPC. To differentiate this type of capitation arrangement from capitation at the individual practice or group level, we include a measure of staff/group model HMOs in our analyses (see below).

A usual source of care was considered capitated if the billing office of the usual source of care reported at least one visit by a family member who was covered by capitation. We include persons in our sample who did not visit the usual source of care provider during the year, when another family member visited the same provider and there is billing data. It is unlikely that a usual source of care provider would be capitated for one family member but not another, and vice-versa—we found very few instances in the data of mixed-forms of reimbursement. Among our sample members reportedly enrolled in an HMO, 46 percent had a capitated usual source of care.

4.3 Consumer Outcome Variables

The household respondent reported on access, service use, preventive care, and satisfaction for all family members. Enrollees in HMOs that capitated their usual source of care were the most likely to report their usual source of care had night or weekend hours (Table 1). Relative to privately insured persons not in HMOs, enrollees in HMOs that capitated their usual source of care reported shorter waiting times in the office when they had an appointment. Enrollees in HMOs that paid the usual source of care on a fee-for-service basis were most likely to report having been asked about treatments from other providers, and enrollees in HMOs that capitated were least likely to report this. As expected, enrollees in HMOs that capitated had the most visits to their usual source of care, but the total number of visits were similar. Adults were equally likely to receive preventive care in all three types of plans. Enrollees in HMOs that capitate were less satisfied with the quality of care from their usual source of care, but their confidence in the provider's ability to treat was not significantly lower.

4.4 Plan Characteristics

HMO enrollment was reported by the household respondent. Among plan characteristics, households are best able to report whether they are enrolled in an HMO, and are less reliable in reporting other plan characteristics (Cunningham et al. 2001; Reschovsky and Hargraves 2000). However, 54 percent of those with private insurance reported they were in an HMO, which is considerably higher than found in other data from insurers. Respondents who think they are in an HMO but are not have experiences more similar to those of people actually in HMOs, and respondents who are in an HMO but think they are not have experiences more similar to those of people actually not in HMOs. Reschovsky and Hargraves find that, in aggregate, using

household-reported HMO status mostly overestimates the effects of HMOs relative to other plans, but the pattern is not uniform.

HMO characteristics were ascertained by matching plan names reported by the household to plan names in Interstudy data. Among those reporting they were in an HMO at the second interview, 78 percent matched to a plan name in the Interstudy data, or if the insurance company reported by the household owned an HMO product, then the person was matched to that HMO product, even if the reported names were not the same. The rest reported: a variety of plan names including employer names, union or other trusts, or plan names that were not identifiable (13 percent), no plan name (2 percent), or were unlikely to be private HMOs (7 percent), including PPOs, POS plans, and TPA or insurance company that did not have an HMO product listed on their internet site in 2002.[5] The Interstudy data provide the HMO model, tax status, whether it is federally qualified, age, and network size. We focus on whether the plan was a group or staff HMO model and tax status, which may be more likely confounded with capitation for the outcome measures we study.[6]

HMOs that capitated were more likely to be group or staff model HMOs and for-profit (Table 2).[7] Groups are likely better able to bear the risk of capitation, so this is not surprising.

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[5] Persons whose plan did not match to the Interstudy data are included in the regression, and they were coded as being in a nonprofit IPA/Network/Mixed/Unmatched HMO, because no available instruments predicted reporting an HMO name that did not match. Future analyses will assess alternative approaches for the names that did not match.

[6] We also calculated network size as physicians per enrollee but we do not have good instruments for this HMO characteristic. We found county-level measures of physicians per capita and other potential instruments were only somewhat correlated with a plan's network size. Network size, however, is not likely correlated with the outcomes we study, and when we included it in the preliminary regressions (without instruments for any variables), it was not statistically significant. Nonetheless, we may be able to add other characteristics for which there are instruments, such as whether the HMO is federally qualified, in the future.

[7] Only a handful of respondents reported the names of staff model HMOs, too few to include a separate variable.

4.5   Provider Characteristic

Forty-six percent of respondents named a clinic, group, or health center instead of a particular person as the usual source of care.[8]   Enrollees in HMOs that capitated were more likely to report a place as a usual source of care (Table 2). If groups have a separate effect on the consumer outcomes, then it is important to control for this factor in the regressions.[9]

4.6   Instrumental Variables

Several county characteristics are the instrumental variables, because they are correlated with the endogenous plan and provider characteristics.   The variables are from the Area Resource File, which provides county-level HMO, hospital, and physician data.

We used the proportion of the county population enrolled in group or staff HMOs and the proportion enrolled in other HMOs. These are correlated with the consumer's type of HMO (Table 2). We also include the Herfindahl index of concentration in the HMO industry, which is also correlated with enrollment in HMOs that capitate. These variables are as of 1998, the first year for which improved county-level HMO enrollment data were available.

Hospital variables measure the number of hospitals per capita and the number of hospitals in a managed care network. These variables are correlated with HMO model and whether the HMO is for profit. The hospital variables are from 1996 and 1997.

Family and general practice physicians per capita, as well as the county-level HMO variables, are correlated with having a place (clinic, health center, or other place), rather than a particular person, as a usual source of care.

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[8] When respondents reported a person at a place, the usual source of care is coded as a particular person.

[9] When the usual source of care is a person, the MEPS HC also asked the type of provider and specialty, but we did not use this information, because we could not find an instrumental variable; county-level measures of the types of primary care providers per capita are not correlated with the specialty of the usual source of care. We cannot identify in the MEPS whether providers are members of physician groups with much certainty.

4.7 Consumer Characteristics

We use a rich set of consumer characteristics, including chronic conditions, activity limitations, perceived health status, demographics, education, and family income. Relative to those not in HMOs, HMO enrollees had fewer moderately severe chronic conditions, and were more likely to be nonwhite or Hispanic (Table 3). Relative to other HMO enrollees, enrollees in HMOs that capitated had more low severity chronic conditions, had somewhat higher education and were much more likely to live in the West and in urban areas.[10]

We constructed a measure of whether the family has a choice of plan based on household reports. The family has a choice of plans if (1) the policyholder has a choice of plans at his or her job, or (2) the policyholder and his or her spouse are offered insurance through their jobs. HMO enrollees were more likely to have had a choice of plans (Table 3).

The MEPS HC also collected information that may proxy for the generosity of benefits, such as whether the insurance plan is employment-related, the policyholder's employer's firm size (including number of employees at the establishment and whether the firm has more than one establishment), and the policyholder's industry. HMO enrollees were more likely to have employment-related insurance and HMO policyholders were more likely to work in larger establishments or firms with multiple locations (Table 3).

4.8 Potential Sample Selection Bias

Sample selection bias is a potential problem with the study, because we limited our sample to privately insured persons with a usual source of care visited by at least one family member during the calendar year. We investigated this problem by looking at three stages of sample selection: (1) privately insured, (2) those with a usual source of care, and (3) those with

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[10] For children, mother's education is used.

billing data. First, we excluded the elderly, and people with private hospital/physician insurance have higher socioeconomic status than the general population, which limits the generalizability of our results.

Compared with privately insured people without a usual source of care, people with one were more likely to report being enrolled in an HMO, had more visits, were less healthy, and had higher socioeconomic status. While we cannot examine whether this biases estimates of the effects of capitation, we can assess whether HMOs have a greater or lesser effect on those with a usual source of care than those without. So we calculated (1) the difference in satisfaction with health plan between HMO enrollees and those not in HMOs among those with a usual source of care, (2) the HMO-nonHMO difference for those without a usual source of care.[11] These two differences were similar.

Billing data to determine whether the usual source of care was capitated was available if a family member (or themselves) visited the person's usual source of care and completed a permission form to collect billing data, and the usual source of care provided billing data. People who met these criteria were more likely to report being enrolled in an HMO, had more visits, were less healthy, and had higher socioeconomic status. However, we calculated (1) the difference in receipt of preventive services between HMO members and other for those with a usual source of care, (2) the HMO-nonHMO difference for those without a usual source of care. These two differences were similar.

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[11] Eleven percent (1,052) of those reporting HMO enrollment reported they did not have a usual source of care. These appear to be actually enrolled in HMOs, because only 61 reported plan names that did not match to the InterStudy data.

To summarize, while there are differences in key characteristics between our sample and the general population, particularly in HMO enrollment and number of visits, these differences do not appear to bias comparisons between HMO members and other privately insured people.

5.   Results

Tables 4 through 9 show the regression coefficients and marginal effects for the plan and provider variables for two types of regressions. The first columns contain maximum likelihood or ordinary least squares regressions where the endogenous variables are treated as if they were exogenous. The instrumental variable estimates (AGLS or 2SLS) are in the second set of columns.

For both sets of results, the coefficients and marginal effects of HMO characteristics are as follows. The Group/Staff and IPA/Network/Mixed HMO coefficients and marginal effects are relative to plans that are not HMOs. The Capitation and For-Profit coefficients are relative to other HMOs, because the Group/Staff and IPA/Network/Mixed HMO variables include all HMO enrollees. For marginal effects from the probit and AGLS models, we compared HMOs that capitate with the average effect of group/staff HMOs and other HMOs, weighted by the percent of HMO enrollees in our sample in each type of plan (10 percent group/staff, 90 percent other). Similarly, we compared for-profit HMOs with the average effect of group/staff HMOs and other HMOs.

5.1   Results without Instrumenting

After controlling for plan, provider, consumer, and policyholder characteristics, the association between capitation and access, service use, and satisfaction diminished in the naïve regressions. For example, in the descriptive statistics in Table 1, enrollees in HMOs that capitated were 13 percent more likely than those in other HMOs to report their usual source of

care had night or weekend hours. In Table 4, enrollees in HMOs that capitated were 5 percent more likely than those in HMOs to report extended hours. The association of capitation with visits to the usual source of care and satisfaction with quality of care was no longer statistically significant (Tables 7 and 9), but the negative association with asking about treatments from others remained strong (Table 6).

In these regressions, group/staff and for-profit HMOs were associated with better access to care on some measures and more visits to the usual source of care. For-profit HMOs and usual sources of care that were places were associated with somewhat lower satisfaction with quality or confidence in the ability of the provider to treat. Having a place, rather than a person, as a usual source of care was negatively associated with both measures of satisfaction with the usual source of care.

The marginal effects of the plan and provider characteristics on visits are similar when estimated with linear and negative binomial regression models. We present linear models, because they are the most comparable to the 2SLS models.

5.2   Overidentification Tests

Across the outcome variables, the set of instruments described in section 4.5 was not rejected in the overidentification tests, with two exceptions. The exceptions are two of the access to care variables (Table 4), where we dropped the instrument most significantly correlated with the regression error, the HMO Herfindahl Index, and the regressions are exactly identified.

Initial overidentification tests led us to drop potential instruments not shown here. In particular, we dropped the number of HMOs in the county, while keeping HMO enrollment, because the high correlation between the measures caused problems with convergence.

5.3   Instrumental Variables Results

The instrumental variables methods yielded very different results. The magnitudes of the estimated marginal effects tended to be much greater and much less precisely measured in the instrumental variables methods. This is not surprising, because instrumental variable techniques reduce the precision of the estimates, and perhaps because we used linear probability models, which are less efficient, for the endogenous variables.

In HMOs that capitated providers, enrollees had greater difficulty contacting their providers on the phone, and the usual source of care was less likely to ask about treatments from other providers (Tables 4 and 6). The marginal effects on these outcomes, however, are implausibly large. The effects of plan and provider characteristics on satisfaction were no longer statistically significant. The positive association between for-profit HMOs and access to care became negative; in Table 5, waiting times are longer in for-profit HMOs. Also, HMOs were significantly associated with less difficulty contacting providers on the phone, a result not previously seen.

Many of the exogenous variables were correlated with consumer outcomes. Health status and demographics were strongly associated with visits, receipt of preventive care, and satisfaction with the quality of care. Having insurance that was not employment-related was associated with more coordination of care and less difficulty contacting the provider on the phone. Measures of the size of the establishment where the policyholder worked were associated with satisfaction, coordination of care, and extended office hours. The policyholder's industry was associated with confidence in the usual source of care's ability to treat. Urban residents' providers were more likely to listen. Neither the education nor the income variables were jointly

significant in any of the instrumental variable regressions, and they were statistically significant in only two of the outcomes regressions without instruments.

6.   Conclusion

Estimates of the impact of capitation are sensitive to whether the regression analysis takes into account plan and provider characteristics and the endogeneity of plan and provider characteristics. We find limited evidence capitation is associated with less access and less coordination of care, but the estimated effects are implausibly large. Furthermore, the reduced coordination of care may reflect the capitated provider delivering more care herself, and hence less need for coordination.

We will extend this research in several ways. First, we will attempt to estimate all the regressions with a GMM estimator, which uses less restrictive assumptions and may be more efficient. Second, we will also conduct Hansen's GMM overidentification test for the instruments and additional sensitivity analyses of the instruments. We will also investigate the availability of additional measures of physician and other market characteristics to use as instruments for the endogenous variables. Additional instruments may allow us to include more endogenous health plan and physician characteristics in our analyses or improve the precision of the characteristics currently used. Third, with GMM, we may be able to estimate some of the outcomes with specifications that may better fit the data. For example, we can use exponential models for visits and ordinal models for satisfaction measures. Fourth, we can extend the analysis with additional adult preventive care measures, but the sample sizes will be smaller and differences in these descriptive statistics are not statistically significant.

The results have several additional limitations. First, the set of available HMO characteristics was limited, so omitted variable bias likely remains an issue. Second, we did not

have details about payment arrangements, so we could not take into account other incentives or the methods used to pay group members. A simple approach would be to interact the capitation variable with whether the usual source of care is a place rather than a person, but we would need a good instrument for the interaction. Third, we relied on household reports of whether the person was in an HMO, which could lead us to estimate HMOs have an effect when they do not. This also suggests our estimates of the effects of capitation relative to HMO enrollment may be smaller than they really are. Fourth, we studied nonelderly privately insured people, which somewhat limits the generalizability.

Our preliminary results suggest that there is still much to learn about the potential effects of capitation on consumers, and it may be difficult to estimate effects with much precision using observational data.

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TABLE 1

ACCESS, VISITS, PREVENTIVE CARE, AND SATISFACTION BY PLAN TYPE

	Enrollees in HMOs that Paid Usual Source of Care		Enrollees in Other Plans
	Capitation	Fee-for-Service	
Access to Usual Source of Care (percent)			
Has night or weekend hours	63**††	50	49
Very difficult to contact by phone	10	10	11
Wait less than 15 minutes in the office [a]	60*	52	50
Listens and gives needed information	96	96	97
Coordination of Care			
Asks about prescription drugs and treatments from other providers	68††	79*	72
Outpatient Visits (mean)			
Total	5.8	5.9	6.2
Usual source of care	3.0*	2.6	2.6
Preventive Care for Adults[b] (percent)			
Physical exam in past year	54	53	53
Blood pressure checked in past year	88	88	88
Satisfaction with Usual Source of Care (percent)			
Very satisfied with quality of care	71**†	79	82
Confident in ability to treat	95	97	96
N	1,319	1,466	1,456

SOURCE: Authors' calculations from the Medical Expenditures Panel Survey (MEPS), first years of Panel 1 (1996) and Panel 2 (1997). Privately insured nonelderly persons with a usual source of care.

[a] When they had an appointment.
[b] 2,733 adults.

 * Statistically different from enrollees in other plans at the .05 level, two-tailed test.
** Statistically different from enrollees in other plans at the .05 level, two-tailed test.
 † Statistically different from enrollees in HMOs paying fee-for-service at the .01 level, two-tailed test.
†† Statistically different from enrollees in HMOs paying fee-for-service at the .01 level, two-tailed test.

TABLE 2

PLAN, PROVIDER, AND COUNTY CHARACTERISTICS BY PLAN TYPE

	Enrollees in HMOs that Paid Usual Source of Care		Enrollees in Other Plans
	Capitation	Fee-for-Service	
HMO Characteristics (proportion)			
Group/Staff	0.20 ††	0.02	N/A
IPA/Network/Mixed/Unknown	0.80 ††	0.98	N/A
For Profit	0.55 ††	0.44	N/A
Usual Source of Care is a Place, Rather than a Specific Person (proportion)	0.56 **††	0.44	0.42
County Characteristics (mean)			
HMO Enrollment (as a proportion of population)			
Group/Staff	0.06 **††	0.03 *	0.02
Other (IPA/Network/Mixed)	0.31 **	0.28 **	0.22
HMO Hefindahl Index	0.72 **††	0.65 **	0.58
Number of Short Term General Hospitals			
Per 100,000 population	1.4 **†	1.6 *	2.4
Participating in a managed care network	3.2 **††	2.3	2.0
Family/General Practice Physicians (per thousand population)	.27	.27	.27
N	1,319	1,466	1,456

SOURCE: Authors' calculations from the Medical Expenditures Panel Survey (MEPS), first years of Panel 1 (1996) and Panel 2 (1997), and the Area Resource File. Privately insured nonelderly persons with a usual source of care.

N/A = not applicable

  * Statistically different from enrollees in other plans at the .05 level, two-tailed test.

** Statistically different from enrollees in other plans at the .01 level, two-tailed test.

 † Statistically different from enrollees in HMOs paying fee-for-service at the .05 level, two-tailed test.

†† Statistically different from enrollees in HMOs paying fee-for-service at the .01 level, two-tailed test.

TABLE 3

PERSONAL AND POLICYHOLDER CHARACTERISTICS BY PLAN TYPE

	Enrollees in HMOs that Paid Usual Source of Care		Enrollees in Other Plans
	Capitation	Fee-for-Service	
Personal Characteristics			
Perceived Health Status (proportion)[a]			
Poor or fair	0.11	0.10	0.10
Excellent	0.51	0.52	0.53
Number of Chronic Conditions (mean)			
Low severity	0.53†	0.44	0.50
Moderate severity	0.32**	0.35 *	0.43
High severity	0.14	0.11	0.13
ADL or IADL Limitation (proportion)	0.01**	0.02	0.04
Age			
Child (proportion)	0.34	0.37	0.33
Adult Age (mean years) [b]	26	26 *	29
Demographics (proportion)			
Women	0.53	0.54	0.53
Nonwhite	0.15**	0.13 *	0.08
Hispanic	0.10**	0.08 *	0.05
Education (proportion)[c]			
Less than high school	0.05	0.06	0.06
High school or equivalent	0.26†	0.33	0.29
Some College	0.36	0.33	0.37
College	0.21	0.20	0.20
Masters	0.11†	0.07	0.09
Family Income as a Percent of the Poverty Line (proportion)			
Less than 125 percent	0.04*	0.06	0.08
125 to <200 percent	0.09	0.12	0.12
200 to <400 percent	0.39	0.40	0.32
400+ percent	0.48	0.42	0.47

	Enrollees in HMOs that Paid Usual Source of Care		Enrollees in Other Plans
	Capitation	Fee-for-Service	
Region (proportion)			
Northeast	0.20	0.22	0.14
Midwest	0.22**	0.25	0.34
South	0.23*†	0.35	0.35
West	0.35**††	0.18	0.17
Urban	0.91**††	0.80 *	0.72
Choice of Plan (proportion)			
Yes [d]	0.70**	0.64 **	0.51
Missing	0.03	0.04 *	0.06
Policyholder Characteristics (proportion)			
Insurance Is Employment-Related	0.94*	0.95 **	0.88
Number of Employees at Policyholder's Work Establishment [e]			
Less than 10	0.11*	0.12 *	0.18
10-49	0.15	0.17	0.20
50-99	0.11	0.13	0.12
100-499	0.27**	0.26 **	0.18
500+	0.26**	0.23 *	0.16
Missing	0.07**	0.06 **	0.13
Policyholder's Employer Has More than One Location [e]	0.69**	0.65 **	0.55
Policyholder's Industry [e]			
Agriculture/forestry/fisheries	0.00†	0.01	0.02
Manufacturing/mining	0.24*	0.25 *	0.17
Construction	0.02**	0.03 *	0.08
Transportation/communications/utilities	0.12	0.10	0.07
Sales	0.08†	0.14 **	0.07
Financial/insurance/real estate	0.06	0.05	0.08
Repair	0.04	0.06	0.04
Personal services/entertainment/recreation	0.01	0.02	0.01
Professional services	0.25	0.19	0.22
Public sector	0.10	0.08	0.08
Missing	0.05**	0.04 **	0.11
N	1,319	1,466	1,456

[a] At either the first or second interview.
[b] Children coded as zero.
[c] Mother's education for children.
[d] Policyholder offered a choice of plans through his or her job, or both the policyholder and his or her spouse are offered insurance through their jobs.
[e] Zero for those whose insurance was not employment-based.

* Statistically different from enrollees in other plans at the .05 level, two-tailed test.
** Statistically different from enrollees in other plans at the .01 level, two-tailed test.
† Statistically different from enrollees in HMOs paying fee-for-service at the .05 level, two-tailed test.
†† Statistically different from enrollees in HMOs paying fee-for-service at the .01 level, two-tailed test.

TABLE 4

ACCESS TO CARE: PLAN AND PROVIDER CHARACTERISTICS

	Has Night Weekend Hours						Very Difficult to Contact by Phone					
	Assumed Exogenous (Probit)			Instrumental Variable Probit (AGLS)			Assumed Exogenous (Probit)			Instrumental Variable Probit (AGLS)		
	Coeff.	Std Err	Mar-ginal	Coeff.	Std Err	Mar-ginal	Coeff.	Std Err	Mar-ginal	Coeff.	Std Err	Mar-ginal
Compared with Other HMOs												
Capitation	.16*	.07	.05	2.6	2.3	.55	.05	.09	.01	8.5**	3.4	.74
For Profit	.25**	.07	.08	.003	1.0	.0005	-.28**	.09	-.05	.7	2.7	.02
Compared with Not HMOs												
Group/Staff	.74**	.13	.24	-1.2	2.1	-.26	.0001	.16	.00	-9.1**	3.7	-.51
IPA/Network/Mixed	-.13	.07	-.04	-1.7	1.5	-.36	.14	.09	.03	-7.0**	2.8	-.51
Usual Source of Care Is a Place, Rather than Person	.73**	.06	.25	2.3*	1.1	.55	.04	.07	.01	4.1	2.4	.51
N		4,046			4,046			4,091			4,091	

SOURCE: Authors' calculations from the Medical Expenditures Panel Survey (MEPS), first years of Panel 1 (1996) and Panel 2 (1997). Privately insured nonelderly persons with a usual source of care.

NOTES: Coefficients on consumer and policyholder characteristics not shown. AGLS = Amemiya's Generalized Least Squares.

 * Statistically significant at the .05 level, two-tailed test. ** Statistically significant at the .01 level, two-tailed test.

TABLE 5

MORE ACCESS TO CARE: PLAN AND PROVIDER CHARACTERISTICS

	Wait Less Than 15 Minutes in Office [a]						Listens and Gives Needed Information					
	Assumed Exogenous (Probit)			Instrumental Variable Probit (AGLS)			Assumed Exogenous (Probit)			Instrumental Variable Probit (AGLS)		
	Coeff.	Std Err	Mar-ginal	Coeff.	Std Err	Mar-ginal	Coeff.	Std Err	Mar-ginal	Coeff.	Std Err	Mar-ginal
Compared with Other HMOs												
Capitation	.13*	.07	.05	.40	2.1	-.05	-.28*	.12	-.02	4.6	3.6	.55
For Profit	-.08	.07	-.03	-2.7*	1.2	-.49	.06	.13	.004	-2.9	1.9	-.44
Compared with Not HMOs												
Group/Staff	.42**	.12	.16	2.3	2.0	.48	.26	.21	.01	-6.4*	3.1	-.99
IPA/Network/Mixed	.07	.07	.03	3.6*	1.5	.69	.05	.12	.003	-2.6	2.3	-.28
Usual Source of Care Is a Place, Rather than Person	-.001	.058	-.001	-2.4	1.4	-.46	-.12	.09	-.01	1.1	1.9	.08
N		3,984			3,984			4,209			4,209	

SOURCE: Authors' calculations from the Medical Expenditures Panel Survey (MEPS), first years of Panel 1 (1996) and Panel 2 (1997). Privately insured nonelderly persons with a usual source of care.

NOTES: Coefficients on consumer and policyholder characteristics not shown.   AGLS = Amemiya's Generalized Least Squares.

[a] When they had an appointment.

 * Statistically significant at the .05 level, two-tailed test. ** Statistically significant at the .01 level, two-tailed test.

TABLE 6

COORDINATION OF CARE: PLAN AND PROVIDER CHARACTERISTICS

| | Asks about Treatments from Other Providers | | | | | |
| | Assumed Exogenous (Probit) | | | Instrumental Variable Probit (AGLS) | | |
	Coefficient	Standard Error	Marginal Effect	Coefficient	Standard Error	Marginal Effect
Compared with Other HMOs						
Capitation	-.27**	.07	-.08	-5.1*	2.1	-.88
For Profit	-.06	.07	-.02	2.2	1.3	.11
Compared with Not HMOs						
Group/Staff	-.05	.12	-.02	2.8	1.9	.38
IPA/Network/Mixed/Unknown	.27**	.08	.08	1.6	1.3	.32
Usual Source of Care Is a Place, Rather than Person	-.10	06	-.03	-1.5	1.5	-.31
N		4,091			4,091	

SOURCE: Authors' calculations from the Medical Expenditures Panel Survey (MEPS), first years of Panel 1 (1996) and Panel 2 (1997). Privately insured nonelderly persons with a usual source of care.

NOTES: Coefficients on consumer and policyholder characteristics not shown. AGLS = Amemiya's Generalized Least Squares.

 * Statistically significant at the .05 level, two-tailed test. ** Statistically significant at the .01 level, two-tailed test.

TABLE 7

OUTPATIENT VISITS: PLAN AND PROVIDER CHARACTERISTICS

	Total Visits				Visits to Usual Source of Care			
	Assumed Exogenous (OLS)		Instrumental Variable (2SLS)		Assumed Exogenous (OLS)		Instrumental Variable (2SLS)	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Compared with Other HMOs								
Capitation	-.50	.36	2.7	5.9	.18	.17	.22	3.4
For Profit	.02	.38	1.7	4.4	-.25	.21	-1.7	2.1
Compared with Not HMOs								
Group/Staff	.28	.72	.16	6.0	.94*	.39	4.1	3.1
IPA/Network/Mixed	-.11	.45	-1.3	4.1	.20	.26	2.2	2.2
Usual Source of Care Is a Place, Rather than Person	-.33	.32	1.7	4.0	.47**	.15	-.18	2.2
N	4,241		4,241		4,241		4,241	

SOURCE: Authors' calculations from the Medical Expenditures Panel Survey (MEPS), first years of Panel 1 (1996) and Panel 2 (1997). Privately insured nonelderly persons with a usual source of care.

NOTES: Coefficients on consumer and policyholder characteristics not shown. 2SLS = Two Stage Least Squares.

*Statistically significant at the .05 level, two-tailed test. ** Statistically significant at the .01 level, two-tailed test.

TABLE 8

ADULT PREVENTIVE CARE: PLAN AND PROVIDER CHARACTERISTICS

	Physical Exam in the Past Year						Blood Pressure Checked in the Past Year					
	Assumed Exogenous (Probit)			Instrumental Variable Probit (AGLS)			Assumed Exogenous (Probit)			Instrumental Variable Probit (AGLS)		
	Coeff.	Std Err	Mar-ginal	Coeff.	Std Err	Mar-ginal	Coeff.	Std Err	Mar-ginal	Coeff.	Std Err	Mar-ginal
Compared with Other HMOs												
Capitation	.03	.08	.01	.65	2.2	.22	-.04	.11	-.01	.83	2.6	.14
For Profit	-.04	.08	-.02	-.69	1.2	-.24	.08	.11	.02	-.85	1.3	-.19
Compared with Not HMOs												
Group/Staff	-.10	.15	-.04	.55	1.4	.19	.22	.19	.05	1.2	1.8	.21
IPA/Network/Mixed	.07	.09	.03	.20	1.3	.07	-.02	.11	-.01	.37	1.6	.09
Usual Source of Care Is a Place, Rather than Person	.005	.07	.002	-.07	.74	-.03	-.05	.09	-.01	-.23	.93	-.05
N	2,723			2,723			2,731			2,731		

SOURCE: Authors' calculations from the Medical Expenditures Panel Survey (MEPS), first years of Panel 1 (1996) and Panel 2 (1997). Privately insured nonelderly persons with a usual source of care.

NOTES: Coefficients on consumer and policyholder characteristics not shown. AGLS = Amemiya's Generalized Least Squares.

  *Statistically significant at the .05 level, two-tailed test. ** Statistically significant at the .01 level, two-tailed test.

TABLE 9

SATISFACTION WITH PROVIDER: PLAN AND PROVIDER CHARACTERISTICS

	Very Satisfied with Quality of Care						Confident in Ability to Treat					
	Assumed Exogenous (Probit)			Instrumental Variable Probit (AGLS)			Assumed Exogenous (Probit)			Instrumental Variable Probit (AGLS)		
	Coeff.	Std Err	Mar-ginal	Coeff.	Std Err	Mar-ginal	Coeff.	Std Err	Mar-ginal	Coeff.	Std Err	Mar-ginal
Compared with Other HMOs												
Capitation	-.10	.07	-.03	-1.1	2.6	-.25	-.03	.11	-.002	-.35	2.7	-.04
For Profit	-.20**	.07	.06	-1.3	1.1	-.29	-.26*	.11	-.02	-.95	1.4	-.13
Compared with Not HMOs												
Group/Staff	-.02	.13	-.01	-.07	2.2	-.02	-.15	.18	-.01	-.22	2.2	-.01
IPA/Network/Mixed	.03	.08	.01	.88	1.6	.14	.16	.12	.01	-.33	1.7	-.02
Usual Source of Care Is a Place, Rather than Person	-.46**	.06	-.12	-1.1	1.1	-.27	-.28**	.10	-.02	1.1	1.4	.10
N	4,224			4,224			4,197			4,197		

SOURCE: Authors' calculations from the Medical Expenditures Panel Survey (MEPS), first years of Panel 1 (1996) and Panel 2 (1997). Privately insured nonelderly persons with a usual source of care.

NOTES: Coefficients on consumer and policyholder characteristics not shown. AGLS = Amemiya's Generalized Least Squares.

*Statistically significant at the .05 level, two-tailed test. ** Statistically significant at the .01 level, two-tailed test.